Conference Reports

LCM 2005 – Innovation by Life Cycle Management

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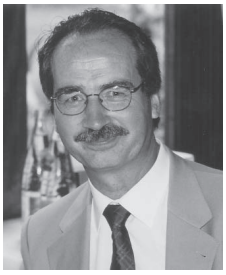
The organizers, lead by **Francesc Castells** and **Joan Rieradevall,** made the, over three hundred participants, feel at home in Barcelona. LCM2005, with a very good balance of industrial and academic participants, as well as several consultants and service providers, was stimulating, efficient and productive. A third of the participants were Spanish, many groups whom, over the past several years have been active in development of environmental life cycle tools. The remaining two hundred participants came from 25 other countries and four continents. The conference was located in the large, newly opened convention center CCIB in the northern part of the city, close to the new landmark of Barcelona, the 142 m high tower of glass and aluminum, 'Torre Agbar'.



Francesc Castells

Organisers LCM 2005

Joan Rieradevall

Conference opening

During the opening of the conference several honorable guests from the local government and city council welcomed the participants and pointed out how the Barcelona region was implementing life cycle thinking in many initiatives. The introductory lecture was given by **Jacqueline Aloisi de Larderel,** the former head of UNEP DTIE in Paris. She reviewed the development of environmental technology, since she began at UNEP in 1989 – a development from cleaner production to sustainable production and consumption. **Aloisi de Larderel** stated that Life Cycle Management (LCM) is now been recognized as a key strategy to help business decisions and can maximize economic value added when appropriately applied. She underlined the importance of the UNEP-SETAC Life Cycle Initiative, in particular the LCM Programme, and mentioned that the Background Document for a LCM Guidebook had been downloaded more than 2000 times monthly from the UNEP website <http://www.uneptie.org/pc/sustain/lcinitiative/publications.htm>

Key players in the UNEP-SETAC Life Cycle Initiative: Helias Udo de Haes, University of Leiden, Jacqueline Aloisi de Larderel and Guido Sonnemann, UNEP

The following two days of the conference each began with industrial keynote lectures. The participants then split into four parallel sessions with 125 oral presentations;

- Production systems
- Agriculture & Energy
- Services
- Integration tools

During the conference over two hundred posters were well exposed with ample time for discussions and debate.

Life cycle management in practice

Several multinational companies have developed new life cycle based sustainable product assessment and management concepts. The three keynote speakers **Andreas Kicherer** from BASF (Germany), **Rana Pant** from Proctor & Gamble (Bel-

gium) and **Gerald Rebitzer** from Alcan (Switzerland) explained their respective views and tools. The well-known BASF Eco-efficiency method has been further developed to include social aspects with the name of 'SEEbalance®', while P&G has developed a 'Product Sustainability Assessment Tool (PSAT)' for identifying areas for improvements. The overall message from the plenary lectures at LCM2005 was a plea from industrialists to render LCA more relevant and applicable within a corporate context. If there could be a singe phrase that can resonate the feeling of these pleas, it may have been **Gerald Rebitzer's** understanding that "*we do not need more questions, rather better answers to existing questions*". Research should focus on "how tools can be used" and on "opportunities instead of impacts". Many noted that the publication of results should not be the ultimate goal, with improved products and the related services the key aim. **Allan Astrup Jensen** (Force Technology, Denmark) reviewed the development of LCM and gave examples of how LCM is not merely a toolbox for multinationals, though also applied in some SMEs, many of whom gave presentations.

Environmental policy and product strategy

Guido Sonnemann summarized in more details the history of the UNEP/SETAC Life Cycle Initiative and made the case for more focus on natural resources and managing of impacts along the life cycle. He also emphasized the need for additional information to consumers on the most significant impacts in light a recent analysis showing that 80% of products consumed are only used once. **Björn Sanden** introduced a methodological framework for LCA of merging technologies and recommended that we are "better to be approximately right than exactly wrong". **Gudrun Wasserman** presented the results from a participatory waste management policy making project in Salzburg, focusing on mid-term impacts of different waste management options including mechanical-biological (pre)treatment and incineration; the later is the best option if energy efficiency is high. **Omar Romero-Hernández** then summarized the findings of a study on PET collection and waste disposal in Mexico, where 30% recycling was found to be the optimum due to high transport distances for recycling industries. **Bernard Sinclair-Desgagnés** ended the session with the history of extended producer responsibility and the present focus on end-of-life management of products; EPR in Germany is estimated to causing costs of 800 $/ton waste due to transport and energy consumption during collection and recycling.

Environmental product declarations

Ingunn Saur Modahl presented results of cooperation with suppliers in the development of environmental product declaration for office chairs. The LCA insights showed improvement options in material choice, increasing the recycling rate and choice of energy carriers and that the wood chair gives least impacts to the environment. **Hugo Storelv** from the producer of the office chairs ('HÅG') gave a very engaged and visionary reasoning for the company's involvement in environmental issues – "the chair is good for your body, your children and the world". **Tomas Rydberg** then provided examples of the use of EPDs in the electronic products sector and **Paolo Frankl** presented the results of an EU study on environmental product information recently published in 'The Future of Eco-labeling' – both actual and interesting reading.

Social factors more in focus

Bo Weidema (2.-0 LCA consultants, Denmark) gave a highly innovative lecture on societal assessment, introducing Quality Adjusted Lost Years (QALS) by combining the World Health Organization's incidence, duration and severity "health-state parallels". His estimates of the global burden of autonomy infringements included bonded and child labor, excessive work, crime, unwanted pregnancies, and refugees, to name just several. He provided a first estimate of the cost of global impacts on human productivity, and reduced societal assessment, from the 200+ indicators some advocate, to a list of six items. The costs, without including synergies, amounted to $32,000/capita and were dominated by missing education, with social and physical infrastructure, health and the effect of trade barriers each over 15% of the ultimate value. Overall, Bo demonstrated that such assessments, which will take time to refine, are possible, and provide important information. We can cite this contribution as a benchmark from LCM2005.

Life cycle thinking in practice

There was presented a number of very well carried out cases, often combining environmental assessments with Life Cycle Costing (LCC). **Stephan Krinke** from Volkswagen AG presented an example of life cycle thinking in the value chain by a new and more efficient process for end-of-life dismantling of vehicles for recycling with 95% recovery of materials. **Emma Rex** from Chalmers University of Technology studied the practice and translation of life cycle thinking in two major companies, Nokia and StoraEnso, by interviewing people from various departments, and she identified important communication barriers to be dealt with. Employees in environmental departments were well aware and already committed though most people from other departments had newer heard about 'life cycle thinking', i.e. there was no common understanding. Those who had, thought it to be synonymous with LCA, recycling or products made out of renewables. Others associated life cycle thinking with 1) the economical life of a single product, 2) the product life cycle from a market perspective, or 3) the process of developing, producing and launching a product within the company.

Integration tools

Na-Kyung Kim (Brunel University, UK) presented an approach for product-oriented environmental management systems (PO-EMS), applied to a range of SMEs in South Korea. She highlighted barriers for SMEs and plead for more customized tools. **Stefanie Hellweg** presented the study on waste solvents conducted for Switzerland and the resulting software for optimization of life cycle management of solvents; data for incineration of solvents is less uncertain than data for distillation. **David Hunkeler** (AQUA+TECH, Switzerland) presented a tool for product design, based on eco-indicator 99 scores. In his method, he provided designers with the impact scores of different design materials, in order to enable an environmentally friendly choice of materials and components. The analytical hierarchy process was used to provide a means by which sensitivity studies could be easily carried out and examples of identifying hot-spots via LCIA-based design on portable air conditioners were presented. The next speaker, **Fabrice Matthieux** (Troyes University of Technology, France) combined the de-

sign tool EIME with the CAD software CATIA. The goal was to enable the consideration of environmental information at the design level. He succeeded in establishing the tool, but the application in industry still needs to be shown. **Thomas Rydberg** (IVL Swedish Environmental Research Institute) illustrated the problems encountered on the EU level with regard to the harmonization of data formats and thus the possibility of data sharing. Finally, **Andreas Ciroth** (GreenDelta^{TC}, Germany) presented a critical review process for the German EPA database, including a simplified method for quick screening of data quality.

Input/Output Analysis

In- and Output Analysis (I/O) and Material Flow Analysis (MFA) have both developed rapidly and in terms of validity. **Christina Sendra** from the Autonomous University of Barcelona discussed material flow analysis (MFA) and noted the important contribution of agriculture and construction to solid waste 83%, ten times higher than that derived from industrial production. **Tak Hur**, from Konkuk University in Korea examined difference in Demand- versus Supply-Induced I/O assessment, noting differences derived not only from the scope though also how externalities are treated. He recommended Demand-Induced I/O for final products and supply-induced for distribution cases.

Waste management options

Several specific cases focused on the environmental impacts of waste management. **Emmanuelle Aoustin** remarked that the CO_2 emissions for composting exceeded those for agricultural disposal of solid wasted. The N and P fertilizer levels were much higher for sludge in the non-digested form, versus that which had been digested. **Ester van der Voet**, of Leiden, compared bioreactors to biological treatments and noted that ecotoxicity could only be reduced if the life cycle energy was also reduced (i.e. the dry material of the transported sludge increased). **Göran Finnveden** and **Tomas Ekvall** from Sweden noted that waste should replace landfill (not recycling) to be a suitable fuel or basis for a heating system. Incineration was never seen to be the best choice when replacing heating. **Larisa Altamira** (Technical University of Denmark) compared various wastewater treatment technologies with the goal of identifying the optimal treatment option for the food processing industry.

Agriculture and food production

The major part of the presentations of the sessions 'agriculture' dealt with applications of life cycle tools to the whole food chain. Valuable in this respect was the presentation of **Thomas Ohlsson**, who illustrated the great diversity of LCA results in this sector: The agricultural phase plays a major role by some raw products like milk or pork meat, or only a minor role by refined products like hamburger. Several very interesting case studies illustrated this debate including Margarine (**Peter Shonfield**), pork (**Llorenç Milà i Canals** for **Anne Merete Nielsen**) and cheese (**Juha-Matti Katajajuuri**). These studies showed the importance of a thorough sensitivity analysis, the requirement of a regional impact assessment as well as the difficulty of gaining representative raw data for the agricultural phase. LCA studies on to orchards and vegetable production showed the rapid development of life cycle tools in the Mediterranean countries.

Agriculture and bio fuel

Several investigations on the agricultural phase, alone were, presented. Fore example, **G. Gaillard** for **Th. Nemecek** as well as **K. Hayashi** discussed arable farming, grassland and horticulture the complexity of defining the optimal intensity level for agricultural production and how case-dependent such a question is. **G. Gaillard** also showed in a comparative study of four environmental farm management tools that a good agreement between the tools regarding the environmental impact of a whole farm is no guarantee for unanimous recommendations because of the different philosophies underlying the methods. **I. Rudneva**, with her impassioned plea for the endangered Black Sea due to agriculture, demonstrated us the urgency of common solutions based on international responsibility for the whole production chain. Regarding bio fuels, **Ph. Osset** and **N. Jungbluth** confirmed the actuality of the topic in Europe. Recent developments in Brazil (e.g. by **L. Kulay**) should bring new incentives in the discussion.

Eco-labeling of biotic resources

The last day saw **Helias Udo de Haes** discuss LCA for Eco-labeling of natural biotic resources. He noted that LCA is limited in regard to resource extraction and pointed to a very limited number of LCAs on wood or fish. The flow characteristics of impact assessment imply it cannot include one-time environmental transitions. Helias showed, quite elegantly, and perhaps fittingly on the last day, how very far LCA has progressed, though the continued work that remains. When one couples this with the business message toward LCC, and the work of SETAC in this regard, as well as the early studies on societal assessment, we are, indeed, much further ahead, after Barcelona, then when we began, two short decades ago.

The challenge is institutional capacity

The closing lecture by **Domingo Jimenez Beltran**, former director of the European Environment Agency in Copenhagen and now director of a new 'Sustainability Observatory' located in Madrid, Spain, was visionary and, figuratively, a barn-burner. Domingo noted that "there were no problems, only opportunities" and pleaded to "rethink everything!" Sustainable development was the EU goal, and he referred to 'the EU Declaration on guiding principles for sustainable development'. LCM is a better framework for working on the conditions for change, which are often more institutional than technical. LCA tens to be a reactive tool, Beltran found. And challenges are huge – "we do more but not with less but with much more."

Associated events

Several UNEP-SETAC Task Force meetings and a workshop on communication of life cycle information to various stakeholders were organized in connection with the conference. The SETAC-Europe Working Group on Life Cycle Costing also had the last meeting, concluding its three-year mandate, with some final editing left before submission of their report to SETAC-Press.

Outlook. The first LCM conference was held in Copenhagen, Denmark, 27–29 August 2001, and the third conference will be in Zürich, Switzerland, 27–29 August 2007, organized by Stefanie Hellweg and Gerald Rebitzer (www.LCM2007.org). The UNEP-SETAC Life Cycle Initiative is associated.